

# Cross-Linked C-Telopeptides in Serum

## *FOR MONITORING RESPONSE TO ANTIRESORPTIVE THERAPY IN OSTEOPOROTIC PATIENTS*

### Test Highlights

- Uses electrochemiluminescent immunoassay (ECLIA) technology.
- Performed on the Roche cobas<sup>®</sup> e411 automated analyzer.
- Broad analytical measurement range from 10 to 6000 pg/mL.
- Less variable serum-based assay.

### Disease Overview

- Osteoporosis is a bone disorder characterized by a loss of bone density and alterations in bone microstructure, making it more susceptible to fractures.<sup>1</sup>
- Osteoporosis most often affects the elderly; women are four times more likely to develop the disease than men.
- Fractures cause considerable morbidity, mortality, economic burden, and decreased quality of life in the elderly population.<sup>1</sup>

### Epidemiology

- In 2003, the World Health Organization (WHO) estimated that 75 million people in the United States, Europe, and Japan were affected by osteoporosis.<sup>1</sup>
- Approximately 1.5 million osteoporotic fractures occur each year in the United States.<sup>1</sup> Approximately 50 percent of women and 10 percent of men over age 50 will suffer a fracture during their remaining lifetime.<sup>1</sup>

### Pathophysiology

- In adults, bone is continually remodeled. Osteoclasts remove (resorb) old and damaged bone, and osteoblasts replace the resorbed bone with new bone.<sup>2</sup> After approximately age 50, bone mass begins to decline as all of the bone resorbed is not replaced by an equivalent amount of new bone. Loss of estrogen at menopause has the effect of reducing osteoblasts and thus accelerating the rate of bone loss.<sup>4</sup> Bone loss in postmenopausal women can be slowed or prevented with hormone therapy or with bisphosphonates, which inhibit bone resorption by osteoclasts.<sup>4</sup> Long-term treatment of postmenopausal women with bisphosphonates has been shown to increase bone density and reduce fractures by approximately 50 percent.<sup>4</sup>
- Cross-linked C-terminal (CTX) telopeptides are proteolytic fragments of type 1 collagen formed during bone resorption. CTX is detected in serum and urine and is thus a biochemical marker of bone resorption.<sup>3</sup> High concentrations of CTX and other biochemical markers of bone formation or resorption indicate a higher rate of bone remodeling (turnover).<sup>3</sup> The bone-turnover rate increases at menopause and is reflected by higher concentrations of biochemical markers.<sup>4</sup> After effective antiresorptive therapy, concentrations of bone markers may return to premenopausal levels.<sup>4</sup>

- Osteoporosis is diagnosed by bone mineral density (BMD).<sup>1</sup> A BMD that is -2.5 standard deviations below a healthy young female population is diagnostic of osteoporosis.<sup>1</sup> Measurement of CTX concentration provides an earlier indication of a therapeutic response than BMD.<sup>3</sup> Changes in bone turnover can be detected in as early as three months by measuring CTX concentrations, whereas 12 to 24 months may be required to detect any changes in bone density by radiographic methods.<sup>4</sup> In addition, testing for CTX is noninvasive and can be repeated often. The CTX test is most useful for monitoring the response to antiresorptive therapy.

### Indications for Ordering

The test may be used as an aid in monitoring antiresorptive therapies (e.g., bisphosphonates and hormone replacement therapy) in postmenopausal women and individuals diagnosed with osteopenia.

### Interpretation

- A drop in CTX concentration of 35 to 55 percent from baseline levels after three to six months indicates effective antiresorptive therapy.
- The absence of a decline in CTX concentration may indicate ineffective antiresorptive therapy or lack of compliance by the patient.

### Limitations

- A baseline concentration of CTX must be established before treatment begins.
- Intraindividual variability of CTX due to diet, exercise, time of day, etc., must be taken into account when interpreting test results.<sup>1</sup>
- This test cannot replace BMD in diagnosing osteoporosis.
- There may be significant overlap in CTX between patients with and without osteoporosis.
- Although levels of CTX are associated with increased risk of fractures, the test cannot be used to predict fractures.
- In patients with reduced kidney function, CTX concentrations may be higher than expected due to reduced excretion of CTX.

## Methodology

The Roche CTX ( $\beta$ -CrossLabs) assay uses two monoclonal antibodies against beta-cross linked CTX. The assay uses a sensitive electrochemiluminescent detection technology and is formatted for the cobas e411 automated analyzer.

## Related Tests

- Osteocalcin by Electrochemiluminescent Immunoassay ([0020728](#))
- N-Telopeptide, Cross-Linked, Serum ([0070500](#))
- N-Telopeptide, Cross-Linked, Urine ([0070062](#))

## References

1. Prevention and management of osteoporosis. Report of a WHO Scientific Group. WHO Technical Report Series, No. 921, 2003.
2. Garnero P, Borel O, Delmas PD. Evaluation of a fully automated serum assay for C-terminal cross-linking telopeptide of type I collagen in osteoporosis. *Clin Chem* 2001;47:694–702.
3. Vasikaran SD. Utility of biochemical markers of bone turnover and bone mineral density in management of osteoporosis. *Crit Rev Clin Lab Sci* 2008;45(2):221–258.
4. Wasnich RD, Bagger YZ, Hosking DJ, et al. Changes in bone density and turnover after alendronate or estrogen withdrawal. *Menopause* 2004;11:622–30.

## Test Information

### **0070416** C-Telopeptide, Beta-Cross-Linked, Serum

For specific collection, transport, and testing information, refer to the ARUP website at [www.aruplab.com](http://www.aruplab.com).

For information on test selection, ordering, and interpretation, refer to ARUP Consult® at [www.arupconsult.com](http://www.arupconsult.com).

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